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TRANSMITTAL OF APPEAL BRIEF	Docket No. 8540G-000187 (GP-303100)

In re Application of: GU, WENBIN ET AL.

Application No.	Filing Date	Examiner	Group Art Unit
10/780,025	February 17, 2004	Walker, Keith D.	1745

Invention: CAPILLARY LAYER ON FLOWFIELD FOR WATER MANAGEMENT IN PEM FUEL CELL

TO THE COMMISSIONER OF PATENTS:

Transmitted herewith is the Appeal Brief in this application, with respect to the Notice of Appeal filed: December 22, 2006 .

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Dated: February 28, 2007

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.:	10/780,025
FILING DATE:	FEBRUARY 17, 2004
APPLICANT:	GU, WENBIN ET AL.
GROUP ART UNIT:	1745
EXAMINER:	WALKER, KEITH D.
TITLE:	CAPILLARY LAYER ON FLOWFIELD FOR WATER MANAGEMENT IN PEM FUEL CELL
ATTORNEY DOCKET:	8540G-000187 (GP-303100)

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is an appeal from the Office Action mailed August 24, 2006, finally rejecting Claims 1-3, 5-12, 15-21 and 23. A Notice of Appeal, Pre-Appeal Brief Request for Review and Petition for Extension of Time were mailed on December 22, 2006, appealing all of the rejected claims. A Notice of Panel Decision from Pre-Appeal Brief Review was mailed January 30, 2007. The appeal brief as required under 37 C.F.R. § 41.37 is due one month from the Notice of Panel Decision, by February 28, 2007.

TABLE OF CONTENTS

I. Real Party In Interest

The real party in interest is General Motors Corporation. An assignment from the inventors to assignee, General Motors Corporation, was executed on February 4 and 5, 2004 and recorded with the U.S. Patent and Trademark Office at Reel/Frame No. 014993/0825.

II. Related Appeals, Interferences, And Judicial Proceedings

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. Status Of Claims

Claims 1-3, 5-12, and 15-23 are finally rejected. Claims 24-29 and 31-50 were withdrawn from consideration. Claims 4 and 30 have been cancelled. The claims on appeal are Claims 1-3, 5-12, and 15-23.

IV. Status Of Amendments

Applicants filed an Amendment After Final Rejection on October 24, 2006 pursuant to 37 CFR §1.116 amending Claim 1 and cancelling Claim 3. These amendments were not entered.

V. Summary Of Claimed Subject Matter

The rejected claims include one independent claim (Claim 1).

Claim 1

Independent Claim 1 recites an electrochemical cell having a membrane electrode assembly (MEA) with an anode and a cathode. Figures 1, 2; Page 1, lines 12-14; page 2, lines 8-10; page 9, lines 10-12. The cell comprises a porous liquid distribution media that is disposed along a major surface of an impermeable electrically conductive element. Page 14, lines 12-15. The liquid distribution media is electrically conductive. Figures 2, 3; Page 19, lines 19-20; page 20, lines 1-4. Further, the liquid distribution media defines flow channels to transport gas and liquid to and from the cathode. Figures 2, 3, 8, 9; Page 2, lines 11-14; page 14, lines 15-19; page 15, lines 11-19; page 16, lines 1-2.

The cell also comprises a fluid distribution layer, which is disposed between the liquid distribution media and the cathode. Figures 2, 8, 9; Page 2, lines 14-17; page 10, lines 12-16, page 11, lines 1-2. The fluid distribution layer transports fluids and liquids between the cathode and flow channels of the liquid distribution media. Figures 2, 8, 9; Page 10, lines 4-14; page 20, lines 9-18. The fluid distribution layer is also porous and has an average pore size that is larger than an average pore size of the porous liquid distribution media. Page 20, lines 19-22.

The liquid distribution media wicks and distributes liquids generated at the cathode and transported through the fluid distribution layer, which maintains uniform water distribution and humidity across the entire surface of the MEA to improve cell performance, durability and longevity. See Page 14, line 15 to page 16, line 2; page 33, line 22 to page 34, line 2. The liquid distribution media also reduces mass transfer resistance by effectively separating gas and liquid transport paths. Page 14, line 15 to page 16, line 2. Thus, the invention of Claim 1 provides a self-regulated water management system, where water is internally distributed within the liquid distribution media and vaporized or entrained by gases passing over the liquid distribution media. Page 33, lines 12-15. The claimed features provide enhanced water removal, reduced potential for electrode flooding, and increased mass transport to regions of lower liquid concentration to promote higher fuel cell operational efficiency and lower electrical resistance loss. Page 33, lines 16-22. Claims 2-3, 5-12, and 15-23 depend on Claim 1.

Claim 3

Claim 3 further defines over the cited art. In Claim 3, the liquid distribution media forms an electrically conductive path between the impermeable electrically conductive element and the conductive fluid distribution layer. Figures 2, 8, 9 and 10; Page 23, lines 18-21.

Claim 6

Claim 6 further defines over the cited art. Claim 6 provides a liquid distribution media that overlies substantially all of the major surface of the electrically conductive impermeable substrate. Figures 2, 3, 8 and 9; Page 21, lines 19-22.

Claim 8

Claim 8 also further defines over the cited art. Claim 8 recites that the liquid distribution media forms an undulated configuration of peaks (lands) and valleys (grooves). Figure 8; Page 23, lines 16-18.

Claim 12

Claim 12 further defines over the cited art and recites a liquid distribution layer that comprises two distinct layers. Figure 9; Page 24, lines 2-6.

Claim 22

Claim 22 is separately rejected because it recites an impermeable electrically conductive element that comprises a compound selected from the group consisting of: aluminum, titanium, stainless steel, and alloys and mixtures thereof. Page 13, lines 18-19.

VI. Grounds Of Rejection To Be Reviewed On Appeal

1. Claims 1-3, 5-12, 15-21 and 23 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Miyazawa (U.S. Pat. Publ. No. 2003/0235735) in view of Yamada (U.S. Pat. No. 5,432,023).

2. Claim 22 stands rejected under 35 U.S.C. § 103(a) over Miyazawa (U.S. Pat. Publ. No. 2003/0235735) in view of Yamada (U.S. Pat. No. 5,432,023) and Davis (U.S. Pat. Publ. No. 2002/0001743).

VII. Argument

A. Claims 1-3, 5-12, and 15-23 Are Not Rendered Obvious By Miyazawa and Yamada Because Yamada Teaches Away From Such A Combination.

Independent Claim 1 recites a fuel cell having a fluid distribution layer (FDL) disposed between an electrically conductive and porous liquid distribution media (LDM) and a cathode.

The LDM has sufficient electrical conductivity to be disposed between an impermeable electrically conductive element (*e.g.*, a separator) and the FDL during fuel cell operation. Further, Claim 1 recites that the FDL has an average pore size that is larger than an average pore size of the porous LDM, which enhances separation of liquids from vapors/gases.

A cell having an LDM, such as that of Claim 1, maintains electrical conductivity while providing various beneficial advantages, including wicking and transporting liquids generated at the cathode, maintaining uniform water distribution and humidity across the MEA to improve cell performance, as well as providing reduced mass transfer resistance by separating gas and liquid transport paths in the flow fields at the cathode. Applicants' specification at page 14, lines 15 to page 16, line 2.

As referred to herein, the cited references, namely Miyazawa (U.S. Pat. Publ. No. 2003/0235735) is referred to as "Miyazawa," Yamada (U.S. Pat. No. 5,432,023) is referred to as "Yamada," and Davis (U.S. Pat. Publ. No. 2002/0001743) is referred to as "Davis."

The Examiner admits that Miyazawa fails to describe or suggest that the FDL has an average pore size that is larger than that of the LDM. Non-Final Office Action dated March 13, 2006 on Page 4, lines 18-19. Yamada does not describe or suggest a pore size for a material used in an active flow field of a fuel cell. While Yamada relates to liquid-fuel based fuel cells that may contain a porous separator plate and/or an external liquid wicking material, it has no suggestion to use any particular porous materials inside the active regions of the fuel cell that transport gases and liquids concurrently. Rather, Yamada places porous water-collecting "wicking" materials in water transport channels and reservoirs that are external to a fuel cell. For example, an electrically insulating water-recovering wick 35 is placed along an exterior of the fuel cell, and only touches an outer edge of the oxidizing electrode 38 (Figure 1), and the water-retaining wick 41 is disposed inside a water-storing receptacle.[1] Col. 38, lines 6-27, Nos. 35 and 41 of Figures 21, 23.

There is no suggestion Yamada to provide such wicking material within the active area of the fuel cell, nor does Yamada suggest bifurcating porous layers into an LDM and FDL, which

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[1] The Non-Final Office Action dated March 13, 2006 on Page 4, line 20 bridging page 5, line 7 misinterprets certain teachings of Yamada in particular to applicability of descriptions of porosity and conductivity of certain materials. See Col. 16, lines 25-40 of Yamada which describes porosity of the separator element, not of a liquid distribution (wicking) element. Col. 24: 14-20 relates to porosity of the electrodes (which must be porous, because it is a liquid fuel cell). The nickel mesh is similarly for an electrode or connector and has no applicability to wicking materials.

each handle both liquids and gases, as claimed. Furthermore, Yamada advises against selecting conductive materials as the wicking material to prevent short circuiting (reinforcing that the wicking materials are exterior to the active fuel cell area). Col. 47, lines 10-15; Col. 38, lines 8-9 and 67-68; and Col. 39, lines 21-25.

The selection of claimed pore sizes of the liquid distribution media and the fluid distribution media relates to the use of such materials in a flow field for a fuel cell, where they encounter not only liquids, but also gases/vapors. Specifically, the pore size selection is related to optimizing the capillary pressure and mass flux, while taking into consideration the permeability properties of the porous material, as well as a range of differential pressures experienced during fuel cell operations across the flow field. See for example, Applicants' specification at Page 17, lines 11-19; page 18, lines 2-4 and 22-23; page 19, line 1; page 20, lines 20-23; and page 21, lines 1-2. The claimed invention provides efficient transfer of water over the entire electrode active face at operating pressures and provides better separation of liquids and gases via the respective porosities of the LDM and FDL, thereby reducing mass transfer resistance and increasing operational efficiency.

The Examiner's proposed modification of Miyazawa by Yamada would render Yamada inoperable; hence, it cannot support a *prima facie* case of obviousness as to Applicants' invention. *McGinley v. Franklin Sports*, 60 USPQ.2d 1001, 1010 (Fed. Cir. 2001) citing *In re Sponnoble*, 160 USPQ 237, 244 (CCPA 1969) (a combination of references which renders a prior art reference inoperable for its intended purpose is improper and does not support a *prima facie* case of obviousness). The Examiner's proposed modification to make the LDM conductive would render Yamada inoperable for its intended purpose because Yamada explicitly teaches that "the materials for the wicks [to transport liquids] are <u>not allowed to be conductors</u> because conductors possibly form a cause for a short circuit." Col. 47, lines 10-15 (*emphasis added*); *see also*, Col. 38, lines 8-9 and 67-68; and Col. 39, lines 21-25. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. *In re Gurley*, 31 USPQ.2d 1130, 1131 (Fed. Cir. 1994).

Because Yamada expressly teaches away from a conductive porous material, the reference cannot suggest using an electrically conductive LDM in the present claims. It is well-settled that teaching away is the antithesis of obviousness. For obviousness, there must be some

motivation to make the change, as well as an expectation of a reasonable likelihood of success. Neither of these elements can be present when the art teaches that the proposed modification is doomed to fail. None of the remaining references relied upon by the Examiner remedy the fatal shortcoming of the primary reference in teaching away from the instant invention.

Thus, the Examiner's proposed modifications of Yamada would render it inoperable for its intended purpose and directly contravene the teachings of Yamada. Miyazawa is silent with regard to electrical conductivity, but consistently teaches removing the hydrophilic layer 14 from any electrical contact points 23. Thus, any proposed combining of Yamada with Miyazawa is impermissible due to the inoperability of Yamada for its intended purpose and cannot support a *prima facie* case of obviousness.

For the reasons set forth above, a *prima facie* case of obviousness has not been established for independent Claim 1, because Miyazawa and Yamada do not provide the necessary suggestion or motivation for combination to arrive at the claimed invention. Accordingly, the Examiner's final rejections of Claims 1-3, 5-12, and 15-23 should be reversed.

B. Claim 3 Is Separately Patentable Over Miyazawa And Yamada Because The Combination Does Not Suggest Forming An Electrically Conductive Path Through The Liquid Distribution Media As Recited In Claim 3.

In addition to the reasons set forth above for Claim 1, none of the cited references describes or suggests forming an electrically conductive path through an electrically conductive porous LDM, which is disposed between an electrically conductive element and a conductive fluid distribution layer (FDL), as recited in dependent Claim 3.

The Miyazawa reference lacks any disclosure or suggestion of a liquid distribution media (LDM) in electrical contact with and forming an electrically conductive path between a fluid distribution layer (FDL) and an impermeable electrically conductive element. The Office Action erroneously states that in the Miyazawa reference "the LDM [14] forms an electrically conductive path between the ECE [4] and FDL [21]." Final Office Action Mailed Aug. 24, 2006, page 3, lines 2-3. However, this statement is wholly unsupported by any teachings of the Miyazawa reference.

The Miyazawa reference consistently teaches that the hydrophilic layer 14 is removed from the electrical contact regions 23 of the ribs 11 (of the separator plate 4) that contact the gas diffusion layer 21 during use. See Response to Office Action Under 37 CFR §1.116; Oct. 24, 2006; Page, 16-17; Miyazawa at Paragraphs [0028] and [0033]. This hydrophilic membrane 14 is the same element that the Examiner relies on as being analogous to the presently claimed liquid distribution media. Thus, Miyazawa does not and cannot meet the limitations of Claim 3, because the hydrophilic membrane 14 (LDM) is never present on the top portions 23 of the ribs 11 during fuel cell operation and, accordingly, cannot possibly be disposed between, or form an electrically conductive path between an impermeable element and a conductive fluid distribution layer.

The Yamada reference fails to describe either 1) a wicking material that is included on an interior of the fuel cell or 2) a conductive wicking material. While Yamada describes using external wicking materials for water collection/storage, a water-recovering wick (35 of Figures 21, 23) and water-retaining wick (41 of Figure 23), such materials are placed exterior to the fuel cell and merely touch an outer edge of the oxidizing electrode 38. *See e.g.*, Figure 1 and Col. 38, lines 6-27. Yamada provides no suggestion to include the wicking material in the active area of the fuel cell and advises against selecting conductive materials as the wicking material to prevent short circuiting (reinforcing that the wicking materials are exterior to the active area of the fuel cell). Col. 47, lines 10-15; Col. 38, lines 8-9 and 67-68; and Col. 39, lines 21-25. Also, in contrast to the statement in the Final Office Action, nickel is described as being suitable for use as a material for an electrode or a connector, not as a wicking material. Final Office Action, dated August 24, 2006, Page 4, lines 7-8. Col. 46, lines 56-58; Col. 47, lines 9-19 and 42-43. There is no suggestion or teaching in Yamada to use an electrically conductive LDM between the FDL, particularly within the fuel cell where the LDM forms an electrically conductive path. Moreover, since modifying Yamada in such a manner would electrically short circuit the fuel cell in Yamada and render it inoperable for its intended purpose, the Examiner's proposed modification cannot support a case of *prima facie* obviousness. Col. 47, lines 10-15; Col. 38, lines 8-9 and 67-68; and Col. 39, lines 21-25. As such, the obviousness rejection of Claim 3 cannot be supported by the combination of Miyazawa and Yamada and should be reversed.

C. <u>None Of The Cited References Teaches Or Suggests A Liquid Distribution Media Overlying Substantially All Of The Major Surface Of The Electrically Conductive Impermeable Element Of Claim 6.</u>

In addition to the reasons set forth above for Claim 1, the rejection of Claim 6 is further deficient because neither of the Miyazawa or Yamada references describe or suggest an electrochemical cell with an LDM overlying substantially all of a major surface of the electrically conductive separator element. As discussed above in the context of Claim 3, the Miyazawa reference provides a hydrophilic layer 14 (analogous to the claimed LDM according to the Final Office Action mailed August 24, 2006, Page 2, lines 18-19 and Page 3, lines 2-3) that is removed from the electrical contact regions 23 of the ribs 11 of the separator plate 4. The hydrophilic layer 14 of Miyazawa is disposed on discrete regions, namely on the bottom and side wall faces 12, 13, but not on the top face 23 of the rib 11. Paragraphs [0028] and [0033]. Hence, Miyazawa fails to teach or suggest an LDM that is disposed over substantially all of a major surface of the electrically conductive element.

The Yamada reference does not account for the deficiencies of Miyazawa, as it only describes using an LDM on an exterior perimeter of the fuel cell. *See e.g.*, Col. 38, lines 6-27 (wicks 35 and 41). Moreover, if the LDM of Yamada covered substantially all of an electrically conductive element, it would have to be modified to be electrically conductive for proper fuel cell functioning, which would render Yamada inoperable, as discussed above. There is no suggestion in either Miyazawa or Yamada to arrive at the subject matter and Applicants request reversal of the Examiner's rejection.

D. <u>None Of The Cited References Teaches Or Suggests A Liquid Distribution Media Forming An Undulated Surface Of Lands And Grooves As Recited In Claim 8</u>.

In addition to the reasons set forth above for Claim 1, Claim 8 is further patentable over the cited art because it provides a liquid distribution media having an undulated configuration of peaks and valley, where the peaks correspond to lands and the valleys correspond to grooves to form flow channels of reactants to the electrochemical cell. The Examiner has failed to point to any portion of the Miyazawa and/or Yamada references that describes such a feature. The

Miyazawa reference merely describes coating discrete regions of a surface with a hydrophilic layer 14, but explicitly teaches away from a feature where the lands might be coated with the liquid distribution media. (As discussed above in regard to Claim 3, the hydrophilic layer 14 is always removed from electrical contact regions/lands 23 of ribs 11.) Yamada specifies that the wicking materials are external to the active area of the fuel cell. Hence, there is no teaching or suggestion in either Miyazawa or Yamada to create lands and valleys that form the flow channels with the liquid distribution media in a fuel cell.

Additionally, Miyazawa and Yamada teach away from the configuration recited in Claim 8. As described previously above, the hydrophilic layer 14 of Miyazawa is removed from the lands (*i.e.,* ribs). Yamada teaches placing the porous wicking material outside the active fuel cell area and further specifies that such a wicking material must be electrically non-conductive. Thus, Yamada teaches away from using a wicking material as an electrically conductive land in accordance with the configuration of Claim 8. Hence, a *prima facie* case of obviousness has not been established for Claim 8 by either Miyazawa or Yamada, whether considered individually or when combined.

E. The Cited References Fail To Support The Rejection Of Claim 12 Having A Liquid Distribution Layer Comprising Two Distinct Layers.

In addition to the reasons set forth above for Claim 1, Claim 12 is patentable over the cited art because it recites a liquid distribution layer that comprises two distinct layers. Again, the Examiner fails to support the rejection of this claim by pointing to anywhere in any of the cited references where such a feature could be found. The rejection of Claim 12 is wholly unsupported because neither Miyazawa nor Yamada describe or suggest such a limitation. As such, a *prima facie* case of obviousness has not been established or supported by the rejection of Claim 12 and Applicants request that the Examiner be reversed.

F. Claim 22 Is Not Rendered Obvious By The Combination Of Miyazawa, Yamada And Davis.

Claim 22 depends upon Claim 1. For the reasons set forth above in the context of Claim 1, Claim 22 is not rendered obvious by either Miyazawa and/or Yamada. The Davis reference

fails to account for the deficiencies of these references and accordingly, Claim 22 should be allowed.

III. Conclusion

The present claims are patentable over the cited art.

As discussed above, the Examiner has not met the burden necessary under applicable law to demonstrate that the claims are rendered obvious over the cited art.

Appellants, therefore, respectfully ask this Honorable Board to reverse the final rejections of the claims on each ground and to indicate that all claims are allowable.

Dated: February 28, 2007

Respectfully submitted,

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CLAIMS APPENDIX

Claims Involved in the Appeal of Application Serial No. 10/780,025

1. An electrochemical cell having a membrane electrode assembly (MEA) comprising an anode and a cathode, the cell comprising:

an electroconductive element comprising an impermeable electrically conductive element having a major surface facing the cathode, and an electrically conductive porous liquid distribution media disposed along said major surface defining flow channels at said major surface for transporting gas and liquid to and from the cathode;

an electrically conductive fluid distribution layer disposed between said liquid distribution media and the cathode for transporting gases and liquids between the cathode and said flow channels; said fluid distribution layer and liquid distribution media constructed and arranged to transport liquids accumulating within the cathode through said fluid distribution layer and to and through said liquid distribution media, wherein said fluid distribution layer is porous and has an average pore size larger than an average pore size of said porous liquid distribution media.

2. The electrochemical cell of claim 1, wherein said impermeable electrically conductive element and said liquid distribution media are arranged together to define said flow channels.

3. The electrochemical cell of claim 1, wherein said liquid distribution media forms an electrically conductive path between said impermeable electrically conductive element and said conductive fluid distribution layer.

4. (cancelled).

5. The electrochemical cell of claim 1, wherein said liquid distribution media is more hydrophilic than said fluid distribution layer.

6. The electrochemical cell of claim 1, wherein said liquid distribution media overlies substantially all of said major surface.

7. The electrochemical cell of claim 1, wherein said liquid distribution media is disposed in regions along said major surface defining separate spaced-apart flow channels at each of said respective regions.

8. The electrochemical cell of claim 1, wherein said liquid distribution media has an undulated configuration of peaks and valleys, wherein said peaks correspond to lands and said valleys correspond to grooves which constitute said flow channels.

9. The electrochemical cell of claim 1, wherein said porous liquid distribution media has an average pore size in the range of from about 0.2 to about 30 microns.

10. The electrochemical cell of claim 1, wherein said liquid distribution media internally re-distributes liquid water thereby minimizing differences in humidity along a face of the MEA.

11. The electrochemical cell of claim 1, wherein said electroconductive element comprises a second impermeable electrically conductive element having a second surface facing the anode and a second liquid distribution media that is attached along regions of said second surface, and a second fluid distribution layer is disposed between said electroconductive element and the anode, wherein said second liquid distribution media contacts said second fluid distribution layer.

12. The electrochemical cell of claim 1, wherein said liquid distribution media comprises a first and a second layer wherein said first layer is in contact with said impermeable electrically conductive element and said second layer is in contact with said fluid distribution layer wherein said second layer is more hydrophilic than said first layer.

13. (withdrawn) The electrochemical cell of claim 1, wherein said liquid distribution media comprises a first and a second layer wherein said first layer is in contact with said impermeable electrically conductive element and said second layer is in contact with said fluid distribution layer wherein said first layer has a larger average pore size than said second layer, such that liquid is transported at a higher rate in said first layer than in said second layer.

14. (withdrawn) The electrochemical cell of claim 1, wherein said liquid distribution media has a first surface and a second surface, said first surface is in contact with the fluid distribution layer and has an undulating surface that corresponds to said flow channels, wherein said second surface is opposite to said first surface and meets with a surface of said impermeable electrically conductive element and is planar.

15. The electrochemical cell of claim 1, wherein said liquid distribution media is electrically conductive and selected from the group consisting of: mesh, screen, and foam.

16. The electrochemical cell of claim 1, wherein said liquid distribution media is constructed of material selected from the group consisting of: carbon, graphite, polymers, stainless steel, chrome and alloys and mixtures thereof.

17. The electrochemical cell of claim 1, wherein said liquid distribution media is formed of materials that are cast, coated, or sprayed onto said major surface.

18. The electrochemical cell of claim 1, wherein said liquid distribution media comprises a conductive polymer or a non-conductive polymer with conductive particles distributed therein.

19. The electrochemical cell of claim 18, wherein said liquid distribution media is cured by application of heat.

20. The electrochemical cell of claim 1, wherein said liquid distribution media comprises a plurality of conductive metal particles selected from the group consisting of: stainless steel, niobium, nickel-chromium-iron alloy inconel, and mixtures thereof.

21. The electrochemical cell of claim 20, wherein said liquid distribution media is formed by sintering said plurality of conductive metal particles by application of heat.

22. The electrochemical cell of claim 1, wherein said impermeable electrically conductive element comprises a compound selected from the group consisting of: aluminum, titanium, stainless steel, and alloys and mixtures thereof.

23. The electrochemical cell of claim 1, wherein said liquid distribution media is formed by etching said major surface.

24. (withdrawn) An electroconductive element for an electrochemical fuel cell, said element comprising:

an impermeable electrically conductive element having a major surface;

a conductive porous layer on said element along said major surface, said porous layer being hydrophilic and operable to transport water from regions having a higher liquid concentration to regions having a lower liquid concentration within said layer, where said porous layer has a first surface and a second surface, said first surface has an undulating surface that corresponds to flow channels, and said second surface is opposite to said first surface and meets with said major surface of said impermeable electrically conductive element and is planar.

25. (withdrawn) The electroconductive element according to claim 24, wherein said porous hydrophilic layer is in contact with a fluid distribution layer which is further in contact and fluid communication with an electrode, and said porous hydrophilic layer is more hydrophilic than either of said electrode or said fluid distribution layer, whereby said porous hydrophilic layer draws water from said electrode through said fluid distribution layer.

26. (withdrawn) The electroconductive element according to claim 25, wherein said electrode is a cathode.

27. (withdrawn) The electroconductive element of claim 25, wherein said porous layer forms an electrically conductive path between said impermeable electrically conductive element and said fluid distribution layer which is electrically conductive.

28. (withdrawn) The electroconductive element of claim 24, wherein said impermeable electrically conductive element and said porous layer are arranged together to define gas flow channels.

29. (withdrawn) The electroconductive element of claim 28, wherein said first undulated surface of said porous layer has an undulated configuration of peaks and valleys, wherein said peaks correspond to lands and said valleys correspond to grooves which constitute said flow channels.

30. (cancelled).

31. (withdrawn) The electroconductive element of claim 24, wherein said porous layer has an average pore size in the range of from about 2 to about 30 microns.

32. (withdrawn) The electroconductive element of claim 25, wherein said porous layer comprises a first and a second layer wherein said first layer is in contact with said impermeable electrically conductive element and said second layer is in contact with said fluid distribution layer wherein said second layer is relatively more hydrophilic than said first layer.

33. (withdrawn) The electroconductive element of claim 25, wherein said porous layer comprises a first and a second layer wherein said first layer is in contact with said impermeable electrically conductive element and said second layer is in contact with said fluid distribution layer wherein said first layer has a larger average pore size than said second layer, such that liquid is transported at a higher rate in said first layer than in said second layer.

34. (withdrawn) A method for making an electroconductive element for an electrochemical fuel cell, comprising:

providing an impermeable electrically conductive element having a major surface;

applying a precursor of a liquid distribution media to said major surface; and

treating said precursor to form a hydrophilic liquid distribution media that is adhered to said major surface.

35. (withdrawn) The method of making an electroconductive element according to claim 34, wherein said precursor is a metallic material selected from the group consisting of: screen, mesh, and foam.

36. (withdrawn) The method of making an electroconductive element according to claim 34, wherein said treating comprises diffusion bonding said precursor to said major surface of said impermeable electrically conductive element.

37. (withdrawn) The method of making an electroconductive element according to claim 34, wherein said precursor of said liquid distribution media comprises a plurality of metal particles and a binder.

38. (withdrawn) The method of making an electroconductive element according to claim 37, wherein said treating comprises applying heat to volatilize said binder and sinter said plurality of metal particles to one another.

39. (withdrawn) The method of making an electroconductive element according to claim 34, wherein said precursor of said liquid distribution media comprises a polymer.

40. (withdrawn) The method of making an electroconductive element according to claim 39, wherein said applying comprises spray coating said precursor comprising said polymer on said major surface.

41. (withdrawn) The method of making an electroconductive element according to claim 39, wherein said treating comprises applying heat to cure said polymer.

42. (withdrawn) The method of making an electroconductive element according to claim 39, wherein said precursor of said liquid distribution media further comprises a plurality of conductive particles and pore-forming constituents.

43. (withdrawn) The method of making an electroconductive element according to claim 42, wherein said treating comprises applying heat at a temperature such that said pore-forming constituent volatilizes.

44. (withdrawn) The method of making an electroconductive element according to claim 43, wherein said treating further comprises dissolving said pore-forming constituent after said applying heat.

45. (withdrawn) The method of making an electroconductive element according to claim 34, wherein said applying comprises attaching a screen to said major surface.

46. (withdrawn) The method of making an electroconductive element according to claim 45, wherein said attaching is selected from the group consisting of: diffusion bonding, brazing, and mixtures thereof.

47. (withdrawn) The method of making an electroconductive element according to claim 34, wherein said treating comprises etching said liquid diffusion media surface to enhance hydrophilicity.

48. (withdrawn) The method of making an electroconductive element according to claim 34, wherein said treating comprises firing said liquid diffusion media surface to enhance hydrophilicity.

49. (withdrawn) The method of making an electroconductive element according to claim 34, wherein said treating comprises chemical vapor deposition onto said liquid diffusion media surface to enhance hydrophilicity.

50. (withdrawn) A method for distributing water within an electrochemical fuel cell comprising:

introducing reactant gases to a respective anode and cathode of a membrane electrode assembly (MEA);

conducting an electrochemical reaction in said MEA thereby

generating water on said cathode side;

transporting water away from said cathode by uptake of water in a

porous fluid distribution layer in contact with said cathode;

transferring said transported water to a porous liquid distribution media contacting said fluid distribution layer, wherein said fluid distribution layer has an average pore size that is larger than an average pore size of said porous liquid distribution media; and

distributing said transferred water within said liquid distribution media from areas having a higher liquid concentration to areas having a lower liquid concentration within said liquid distribution media.

<u>EVIDENCE APPENDIX</u>

Evidence Pursuant to §§ 1.130, 1.131, or 1.132 or Entered by or Relied Upon by the Examiner being Submitted in the Appeal of Application Serial No. 10/780,025.

NONE

RELATED PROCEEDINGS APPENDIX

Proceedings Related to the Appeal of Application Serial No. 10/780,025.

NONE